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obtained. Possibly the application of this method to a world outline of vegetation was premature at the time when Birot prepared this volume, but it does not appear to have been an exhaustive search of the literature.

In short, the principal criticism of this book is the grievous fault of ambition — too much attempted. The lack of relationships drawn between the two major themes, of the formations and their productivity, is characteristic. The brevity of the descriptions of the formations calls for the use of slides or, in fact, of a photographic album by Clozier which must be considered as an essential complement to this volume. The evolutionary and geological history justifying the floristic nature of these vegetative formations is barely touched upon. Yet, other than the frequent appearance of climatic change, *deus ex machina*, and its implicit effects, little use is made at a regional level of the physiological bases of the book.

The whole book, in fact, has the allure of a partially revised series of lecture notes : excellent first chapter, excellent outline, concrete examples cited from periodical literature (and often substituted for any attempt at regional synthesis), yet a very sketchy presentation. Despite the subject, it would appear that the book was rushed into print without adequate attention from editor or proof-reader, for a myriad of typographic and orthographic errors and inconsistencies dot its pages, the illustrative material and captions in particular.

Yet it has also the good qualities of a course of lectures : a stimulating introduction and outline, a good idea still fresh, a guide however incomplete to inform one's future reading in ecology and biogeography.

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SHELFORD, Victor E. **The Ecology of North America.** Urbana, University of Illinois Press, 1963. xxii+610 pages, maps, illus., bibliog., and species index.

This volume is supposedly the first comprehensive ecological description of North America as it appeared in the period 1500 to 1600 A.D. The book actually culminates the life work of V. E. Shelford, « the father of modern animal ecology and bioecology. »

The work is indeed a meaty piece of ecological literature as attested to by the first twelve pages. Chapter 1 is devoted to « The Scope and Meaning of Ecology », and includes a concise analysis of the field and its terminology. The remaining eighteen chapters, however, are concerned with the diverse variety of natural communities in North America. The author approaches such a vast geographical area by dividing Canada, the United States, and Mexico into twelve large to medium-sized biomes. Because these major communities are seldom uniform in character throughout, they are further subdivided into plant associations and faciations.

It is pertinent to note that the author defines a biome as the largest community (e.g. tundra) recognized by the character of its climax, but including several stages as well. Shelford stresses that biomes are plant formations with the animal constituents integrated. Actually this latter fact not only emphasizes an often neglected segment of ecology, but also gives the volume a fresh integrating quality not duplicated elsewhere in ecological literature. Such an introduction of animals into the community classification based on plants represents original thinking and considerable reorganization of current community concepts. Shelford justifies using animals under four conditions, the most important being when some significant animal species are distinctive and present throughout the community. Thus the Temperate Deciduous Forest Biome (chapter 2) is also called the *oak-deer-maple biome*, the Boreal Coniferous Forest (chapter 5) is likewise termed the *spruce-caribou-biome* by the author, and so forth.

Although Shelford lists the characteristic species of both animals and plants for each different community, gives quantitative data on the populations of animals and densities of plants, describes the food habits of animals, and shows other interrelationships between animals and vegetation, too little information is presented about the pre-European settlement period, which was, after all, the goal of the book. Shelford himself admits in Chapter 1 : « Unfortunately, plant and animal communities were in shambles before scientific study began. Thus the ecology

of North America must be largely reconstructed from the observations of travelers and studies made from other viewpoints ; hence it will, of necessity, be incomplete. »

Nevertheless a scanning of the hundreds of references cited throughout the text convinces the reviewer that Shelford failed to use the rich, available geographical and historical literature for relevant and supporting environmental-cultural evidence about the sixteenth century. The book tends to over-stress certain known facts of historical biology without actually reconstructing sixteenth century environment. This oversight leads the text away from the ecological past to emphasize the ecological present. After reading a few chapters it becomes obvious that the author could have presented a sounder, more thorough ecological interpretation of the pre-European settlement period by using standard, well-known geographical references like Brown, Sauer, Thomas, and many others. These omissions lead to unfortunate statements in the text. One obvious example can be cited in Chapter 2, The Temperate Deciduous Forest Biome, when Shelford states : « Fire was sometimes used (by the Indians) to remove trees, and fires also resulted from lightning. However, fires were generally unimportant, since the shady forest held considerable moisture and the many streams prevented their spread. » The latter statement is completely false as illustrated by many examples in the Appalachians. Numerous glades and meadows were formed there by repeated Indian burning. Perhaps even the origin of « balds » in the Southern Highlands stem from a similar human cause. Likewise « Indian Old Fields » existed in various parts of the Piedmont Plateau and in the Ridge and Valley province before the period of European exploration and discovery in the sixteenth and seventeenth centuries.

Another major criticism of the reconstruction of the sixteenth century is the volume's imbalance of environmental characteristics. Edaphic conditions are almost totally neglected for this period, while topographic features fare only slightly better. Little if anything is mentioned about past climatic events, such as pluvial versus dry cycles in the southwest, the natural agency of lightning strikes in the Sierra Nevadas, the effects of salt spray and wind shear on Pacific Coast communities, and so on. All of these conditions, plus many more, were apparently just as prevalent in the sixteenth century as they are today.

In summary, this book approaches the claim of enabling ecologists to better interpret present-day conditions by giving them useful background information on the ecology of North America. However, it falls short of its goal of being an ecological reconstruction of sixteenth-century North American environments. Further, the volume hits and misses at establishing a means of evaluating the changes in North American animal and plant resources wrought by civilization over the past four hundred years. The book will not appeal to the average farmer, sportsman, or general readers (as claimed on the front jacket) due to its scientific style. For the serious student of ecology, however, the work will aid and indeed stimulate further efforts « to learn the structure, composition, and dynamics of the original communities of North America before they finally succumb to the advance of civilization. » Perhaps for modern ecologists and biogeographers this quote by Shelford is no longer feasible.

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GÉOMORPHOLOGIE

LLIBOUTRY, Louis. **Traité de glaciologie.** Tomes I et II. Paris, Masson & Cie, 1965.

Glaciology, as Professor Lliboutry points out, is « l'étude de toutes les formes que prend la glace dans la nature, de leurs circonstances d'apparition et de l'action de la glace sur les sols ou sur le relief ». Its techniques thus are as diverse as its subject matter is wide ranging. In recent years, particularly since the International Geophysical Year, the output of glaciological publications has been enormous, and the subject continues to advance at a rate which makes difficult any attempt to keep abreast of advances. The absence of a good general treatise dealing with the entire range of glaciological topics has been very apparent, and it is fortunate that this gap has now been filled by the publication of Professor Lliboutry's two volume work.